



# Mission Thread Workshop (MTW): Preparation and Execution

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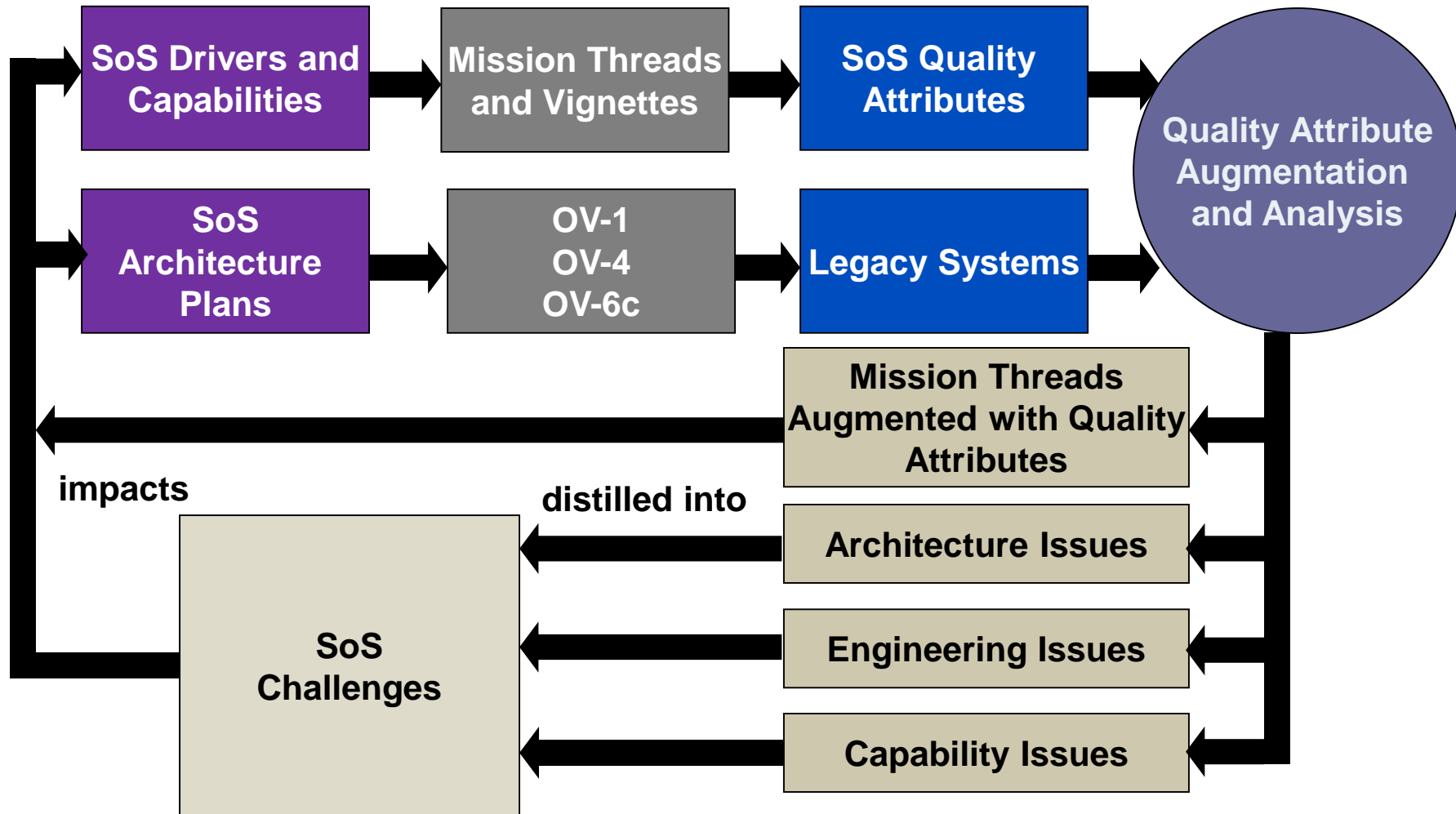
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# Outline

- MTW and our experience base
- Three phases for conducting an MTW
- How MTWs fit into system-of-systems (SoS) architecture development and analysis



# Conceptual Flow of the MTW





# Mission Thread Workshops – Experiences

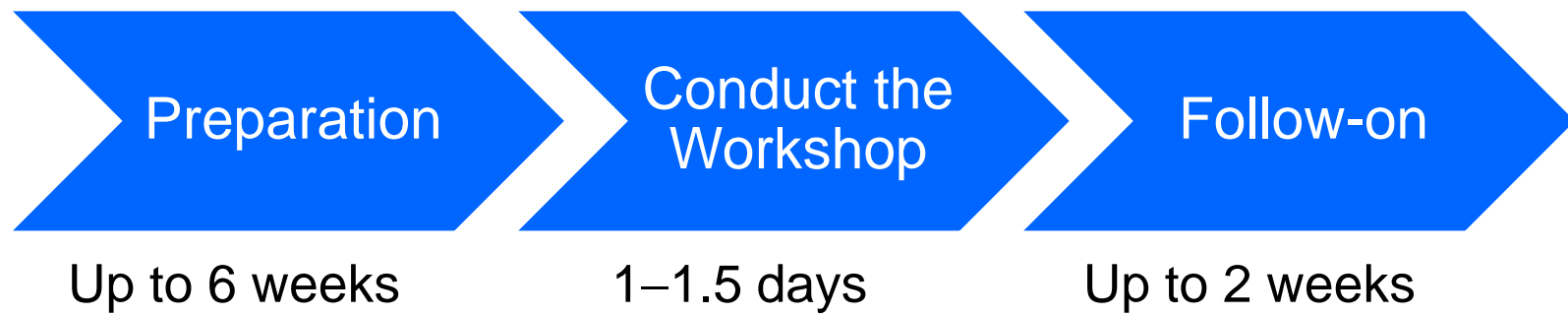
Client	Description	MTWs	Vignettes	Mission Threads	Stakeholders
A	IRAD New Platform/Capability	1	1	2	8
B	New Naval Ship	13	17	37	>200
C	Battle Command	6	3	4	>100
D	Maritime Detection	2	4	4	30
E	NSF	1	3	3	15
F	Air Force Program	1	1	1	10
G	DHS	2	2	3	23
H	Other Govt Agency	1	4	4	12

- Identifies SoS architecture gaps, overlaps, and challenges
- Identifies issues for constituent legacy systems and software architectures
- Overcomes organizational stovepipes and facilitates stakeholder communication





# Three Phases of an MTW Engagement



## MTW Timeline



# Preparation Phase

- Review the MTW process
- Develop SoS mission and business drivers
- Develop SoS architecture plans
- Develop the vignettes, mission threads, and appropriate quality attributes
- Identify participating stakeholders
- Select MTW team
- Settle on logistics





# SoS Mission and Business Drivers and Architecture Plans

## Overview presentation of the SoS mission and business drivers

- 1–2 slides on the business drivers; more if agreed it's needed
- Identify business/programmatic context, high-level functional requirements, high-level constraints, high-level quality attributes, plan for development, and the program's goals and objectives

## Overview presentation of the SoS architecture plans

- 1–2 slides on the vision for the architecture; more if agreed it's needed
- Identify legacy systems being considered, high-level constraints, high-level quality attributes, and the plan for development
- Visio/PowerPoint

## Need to establish the scope of the mission thread analysis effort

- 70–80% functionality



# Vignettes

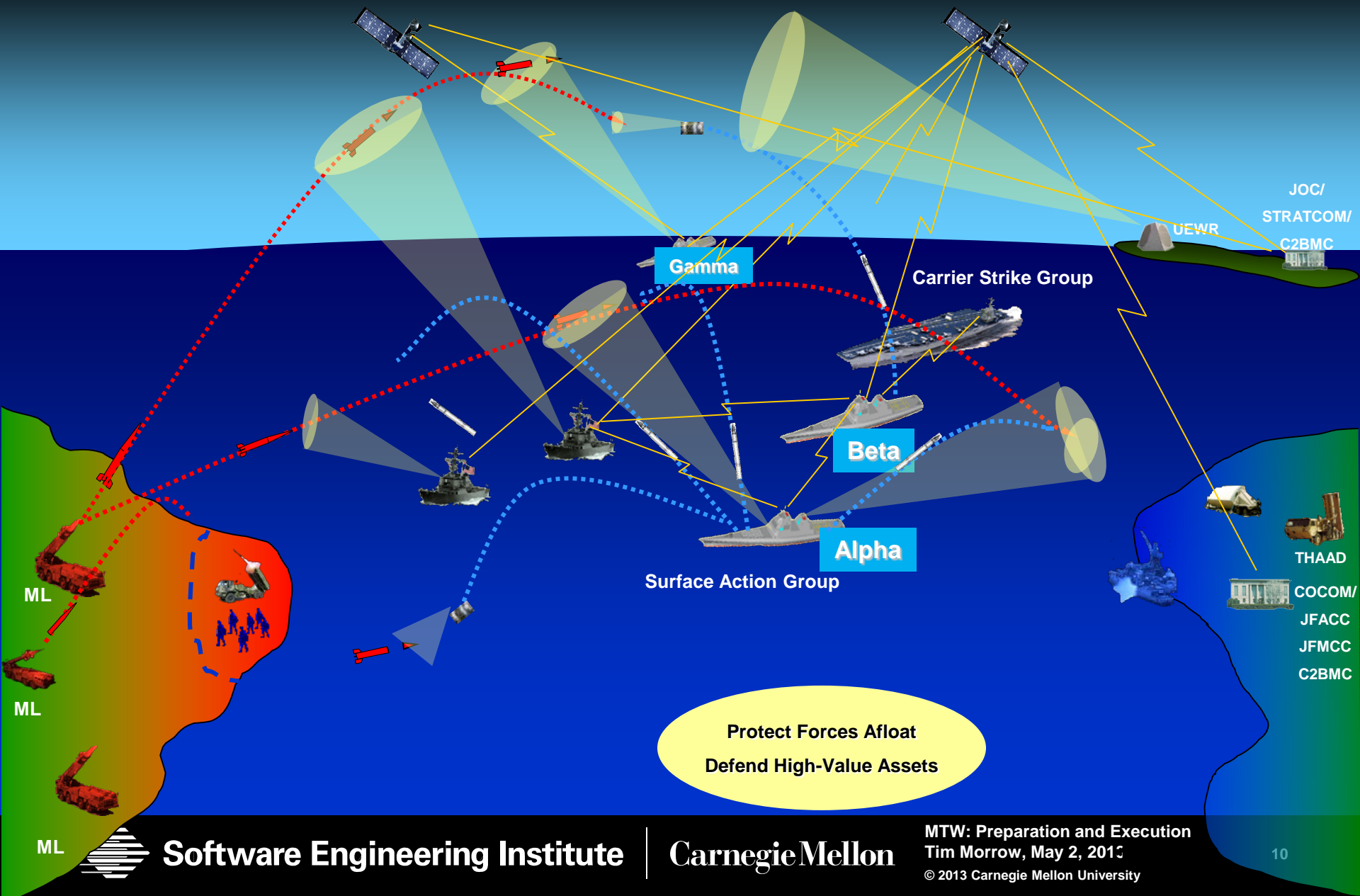
A vignette has two parts:

1. Vignette description
2. Graphical description of the vignette, such as an DoD OV-1 or context diagram.

Name of Vignette	Protect Fleet Assets Against Cruise Missile Attacks
Vignette (summary description)	<p>Two ships (Alpha and Beta) are assigned to air defense to protect a fleet containing two high-value assets. A surveillance aircraft and four UAVs (two pairs) are assigned to the fleet and controlled by the ships. A pair of UAVs flying as a constellation can provide fire-control quality tracks directly to the two ships. A two-pronged attack on the fleet occurs:</p> <ul style="list-style-type: none"><li>- five aircraft-launched missiles from the southeast</li><li>- three minutes later, seven submarine-launched missiles from the southwest</li></ul> <p>The fleet is protected with no battle damage.</p>
Nodes/actors	Alpha and Beta ships, two high-value assets, surveillance aircraft, UAVs, missiles
Assumptions	Sea state is Level 1 Etc.



# Ballistic Missile Defense (BMD) OV-1 Example



# Example of a Context Diagram for a Wireless Emergency Alerts Message



# Mission Thread Snippet

Step	Description	Engineering Considerations, Issues, Challenges
1	A large truck carrying pesticide goes through an intersection with a "RED" traffic light and is hit broadside by an SUV. Both vehicles burst into flames.	1.
2	Several citizens in cars that were approaching the intersection stop and call 911 to report the accident. Others rush to assist the accident victims.	1. 911 call center starts receiving calls but is quickly overwhelmed with the volume 2. Calls start rolling to neighboring 911 call centers 3. Begin initial assessment
3	Driver from SUV is pulled from vehicle and placed on a nearby lawn.	1. Fire, police, EMS are dispatched to accident 2. No information provided to public yet. (should any be?) 3. A smoke plume begins drifting toward residential area.



# Quality Attributes

Quality Attribute	Considerations
Performance	
Security	
Usability	
Resilience	





# Wrap-up of Preparation Steps

## Identify participating stakeholders

- Need to elicit architectural and engineering considerations for the mission threads
- Experience of stakeholders largely determines quality of the results

## Select MTW team

- Consists of three or more people who fill the four MTW roles (lead, facilitator, scribe, and analyst)
- Experienced architects with good facilitation skills and related quality attribute knowledge

## Logistics of the MTW

- Room, equipment



# Conduct Workshop Phase

- Present the MTW
- Present the business and mission drivers
- Present the architectural plan
- Review the vignette
- Augment the mission thread
- Consider extensions to the mission thread
- Discuss overarching quality attribute considerations
- Analyze remaining mission threads





# MTW Agenda

## **Day 1: XX XXX 2009**

08:00–08:15	Welcome/Introductions/Opening Remarks (name, SEI)
08:15–08:30	MTW Overview (SEI)
08:30–08:45	Business Drivers and Quality Attributes (name)
08:45–09:00	Architecture Plan (name)
09:00–09:30	Vignettes and OV-1 Descriptions (name)
09:30–09:45	Break
09:45–12:00	Augmentation of Mission Threads (SEI facilitated)
12:00–13:00	Lunch
13:00–17:00	Augmentation of Mission Threads (SEI facilitated)

## **Day 2: XX XXX 2009**

08:00–12:00	Augmentation of Mission Threads (SEI facilitated)
12:00–13:00	Lunch
13:00–16:30	Augmentation of Mission Threads (SEI facilitated)
16:30–17:00	Summary/Wrap Up





# Follow-On Phase

- Scrub the augmented mission threads
- Reference each comment with a unique identifier
- Produce a group of challenges
- Develop a briefing to summarize the challenges
- Complete the Mission Thread Description Document



# Augmented Mission Thread

Step	Description	Engineering Considerations, Issues, Challenges
1	A large truck carrying pesticide goes through an intersection with a "RED" traffic light and is hit broadside by an SUV. Both vehicles burst into flames.	1.
2	Several citizens in cars that were approaching the intersection stop and call 911 to report the accident. Others rush to assist the accident victims.	1. 911 call center starts receiving calls but is quickly overwhelmed with the volume 2. Calls start rolling to neighboring 911 call centers 3. Begin initial assessment
3	Driver from SUV is pulled from vehicle and placed on a nearby lawn.	1. Fire, police, EMS are dispatched to accident 2. No information provided to public yet. (should any be?) 3. A smoke plume begins drifting toward residential area



# Scrubbed, Augmented Mission Thread

Step	Description	Engineering Considerations, Issues, Challenges
1	A large truck carrying pesticide goes through an intersection with a "RED" traffic light and is hit broadside by an SUV. Both vehicles burst into flames.	MT1-1-1.
2	Several citizens in cars that were approaching the intersection stop and call 911 to report the accident. Others rush to assist the accident victims.	MT1-2-1. 911 call center starts receiving calls but is quickly overwhelmed with the volume MT1-2-2. Calls start rolling to neighboring 911 call centers MT1-2-3. Begin initial assessment
3	Driver from SUV is pulled from vehicle and placed on a nearby lawn.	MT1-3-1. Fire, police, EMS are dispatched to accident MT1-3-2. No information provided to public yet MT1-3-3. A smoke plume begins drifting toward residential are.



# Challenge Area Grouping

## Initial Grouping

Category	Mission Thread Reference
Alert severity levels	Assumptions, MT5-10-5
911 call center overload	MT2-4-1, MT2-4-2, MT4-4-3, MT4-5-4, MT5-9-1, MT5-9-2, MT5-9-14, MT5-10-6, MT5-10-10
Public education – alert awareness	MT3-4-5, MT4-9-2, MT4-9-16, MT5-11-2, MT5-11-6, MT5-11-11
Role of a communications manager	MT1-4-7, MT1-9-2, MT1-9-7, MT1-9-8, MT2-10-6, MT2-11-6, MT2-11-11
Tool features	MT3-4-9, MT5-1-5, MT5-1-11
Coordination and jurisdiction	MT2-4-11, MT2-5-1, MT4-6-2, MT4-9-5, MT4-11-1
Future information inputs	MT3-5-3, MT3-9-6, MT3-9-13, MT3-9-16
Operator training	MT2-9-3, MT2-9-6, MT2-9-16, MT2-10-6
Mutual aid agreements/awareness	MT1-5-4, MT1-9-5, MT1-9-6, MT1-9-8, MT4-6-3, MT4-6-4
Operators' procedures	MT2-4-2, MT2-6-2, MT3-9-1, MT3-9-16, MT4-4-6, MT4-4-10
Scenario planning	MT1-9-1, MT1-9-9, MT1-9-10, MT3-3-2, MT3-3-9, MT3-3-11
Public's expectations	MT1-4-12, MT1-9-2, MT1-9-16, MT1-11-2, MT1-11-6
When to send an alert	MT1-4-3, MT2-6-2, MT2-6-3, MT2-6-4, MT3-9-7, MT4-2-4, MT4-3-5
Communication channels	MT1-4-1, MT1-4-10, MT3-5-3, MT3-6-2, MT4-9-1, MT4-9-2, MT5-3-6
Security	Sec-2, Sec-4, Sec-5

## Challenge Areas

Category	Mission Thread Reference
Alert severity levels/When to send an alert	Assumptions, MT5-10-5, MT1-4-3, MT2-6-2, MT2-6-3, MT2-6-4, MT3-9-7, MT4-2-4, MT4-3-5
Tool features/Future information inputs	MT3-4-9, MT5-1-5, MT5-1-11, MT3-5-3, MT3-9-6, MT3-9-13, MT3-9-16
Coordination and jurisdiction/Mutual aid agreements/Awareness	MT2-4-11, MT2-5-1, MT4-6-2, MT4-9-5, MT4-11-1, MT1-5-4, MT1-9-5, MT1-9-6, MT1-9-8, MT4-6-3, MT4-6-4
Operators' procedures/Operator training	MT2-4-2, MT2-6-2, MT3-9-1, MT3-9-16, MT4-4-6, MT4-4-10, MT2-9-3, MT2-9-6, MT2-9-16, MT2-10-6
Scenario planning/911 call center overload	MT1-9-1, MT1-9-9, MT1-9-10, MT3-3-2, MT3-3-9, MT3-3-11, MT2-4-1, MT2-4-2, MT4-4-3, MT4-5-4, MT5-9-1, MT5-9-2, MT5-9-14, MT5-10-6, MT5-10-10
Public's expectations/Public education – alert awareness/Role of a communications manager	MT1-4-12, MT1-9-2, MT1-9-16, MT1-11-2, MT1-11-6, MT3-4-5, MT4-9-2, MT4-9-16, MT5-11-2, MT5-11-6, MT5-11-11, MT1-4-7, MT1-9-2, MT1-9-7, MT1-9-8, MT2-10-6, MT2-11-6, MT2-11-11
Communication channels	MT1-4-1, MT1-4-10, MT3-5-3, MT3-6-2, MT4-9-1, MT4-9-2, MT5-3-6
Security	Sec-2, Sec-4, Sec-5



# Example of a Challenge

Challenge: What civil emergencies are worthy of a WEA message?

Category grouping: Operational procedures, governance

Supporting info

- MT5-10-5
- MT2-6-2, MT2-6-3, MT2-6-4
- MT4-3-5

Recommendations

- Continue to identify and develop civil emergency scenarios that can be discussed with first responders and partnering communities to develop a consistent approach for determining when to issue WEA messages.
- Continue to host meetings with NWS, FEMA, DHS, and the state to share information about when it is appropriate to send a WEA message.



# Contents of the Mission Thread Description Document

## Inputs

- Presentations
  - MTW process
  - Business and architecture drivers and plans
- Tailored vignette(s) and mission threads

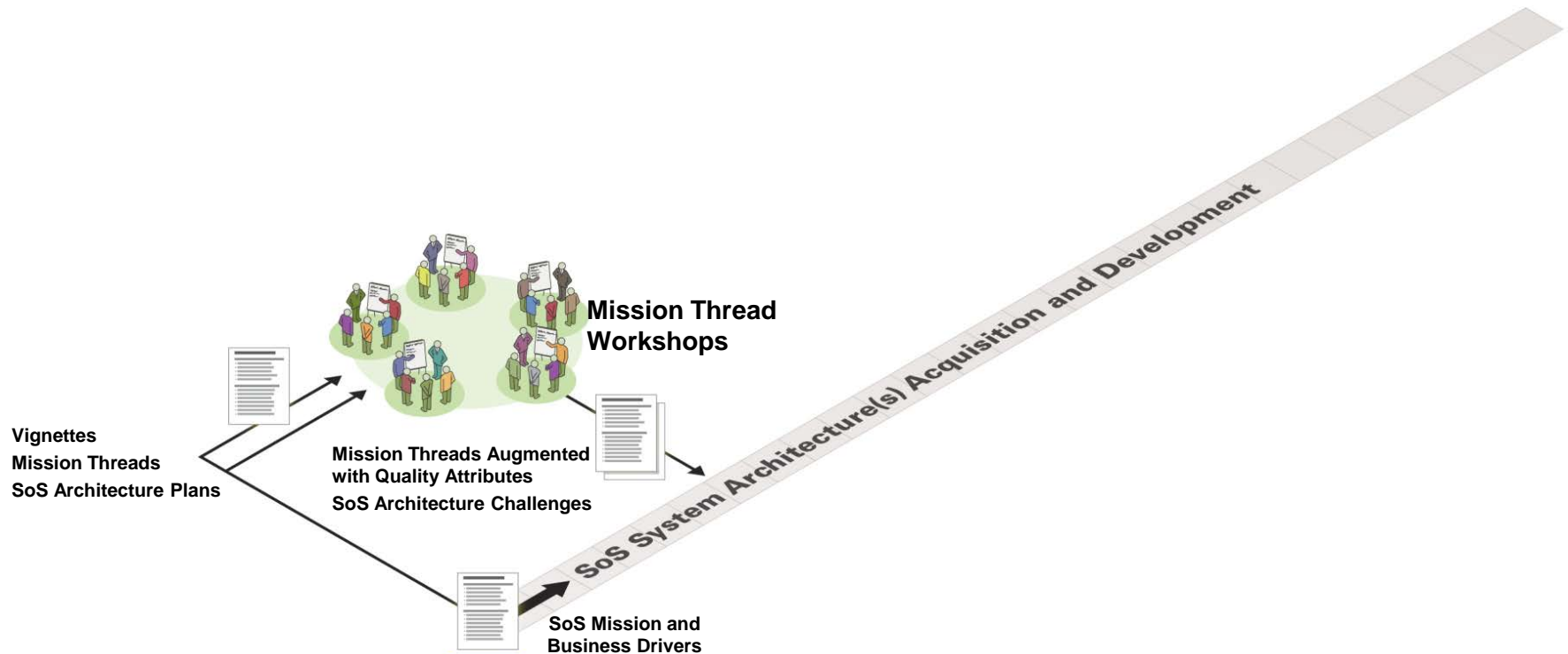
## Outputs

- Mission threads augmented with quality attributes
- Analysis methods
- Challenges

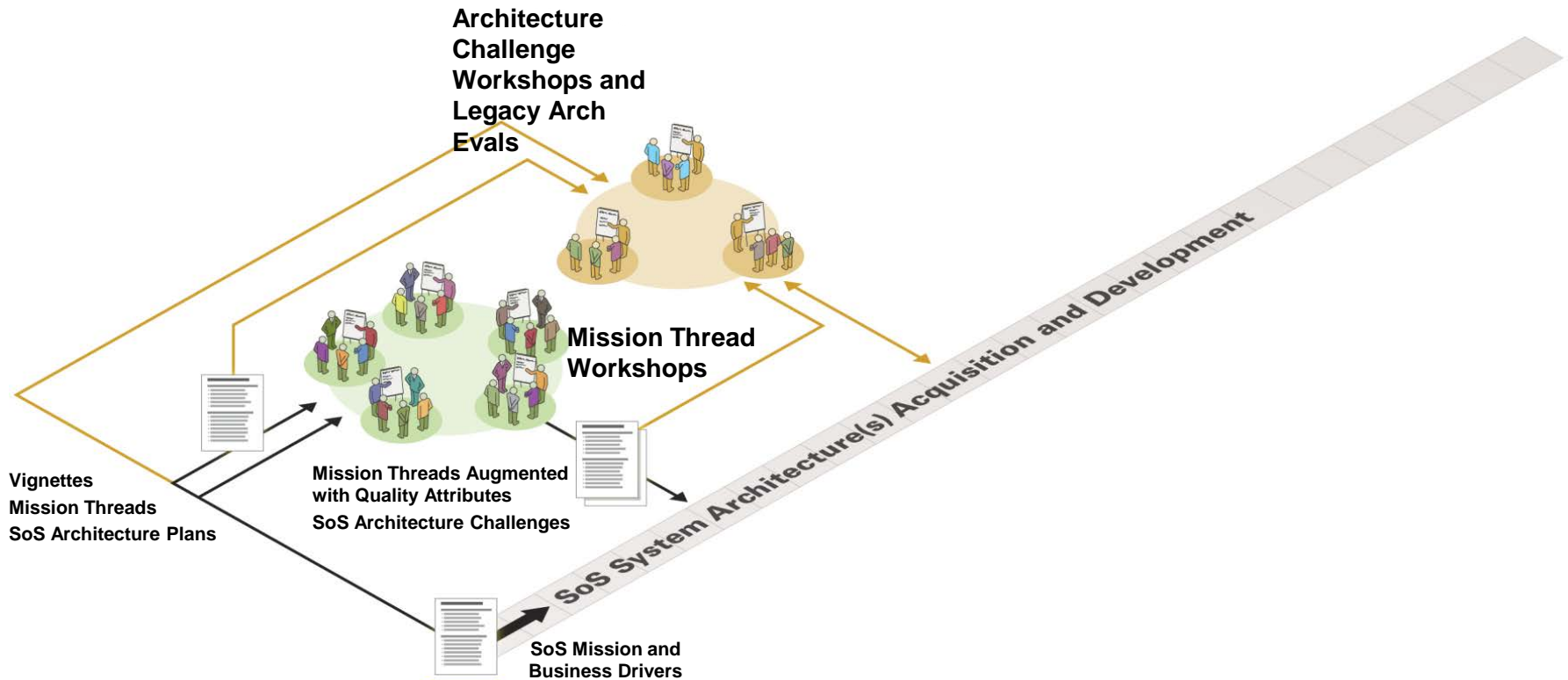




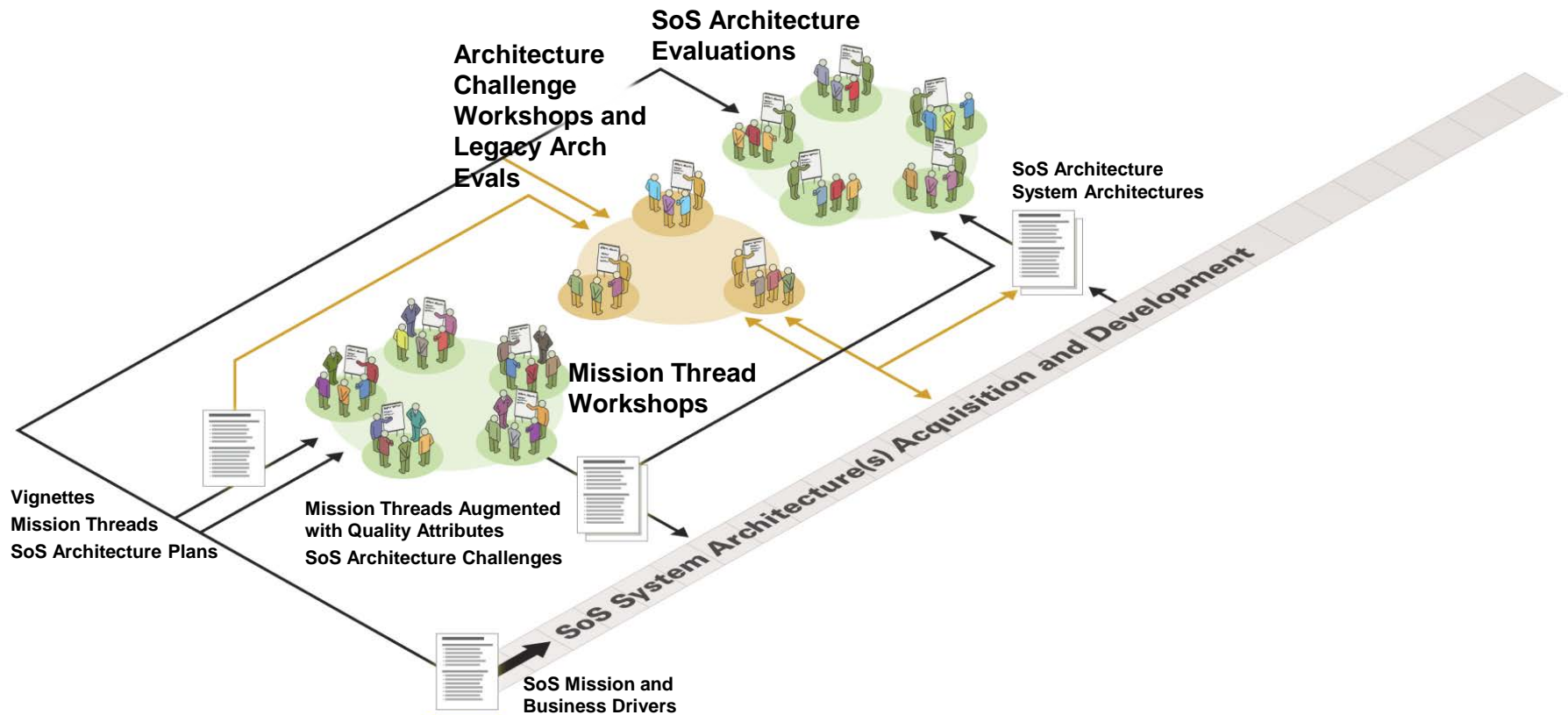
# How MTWs Fit into SoS Architecture Development and Analysis



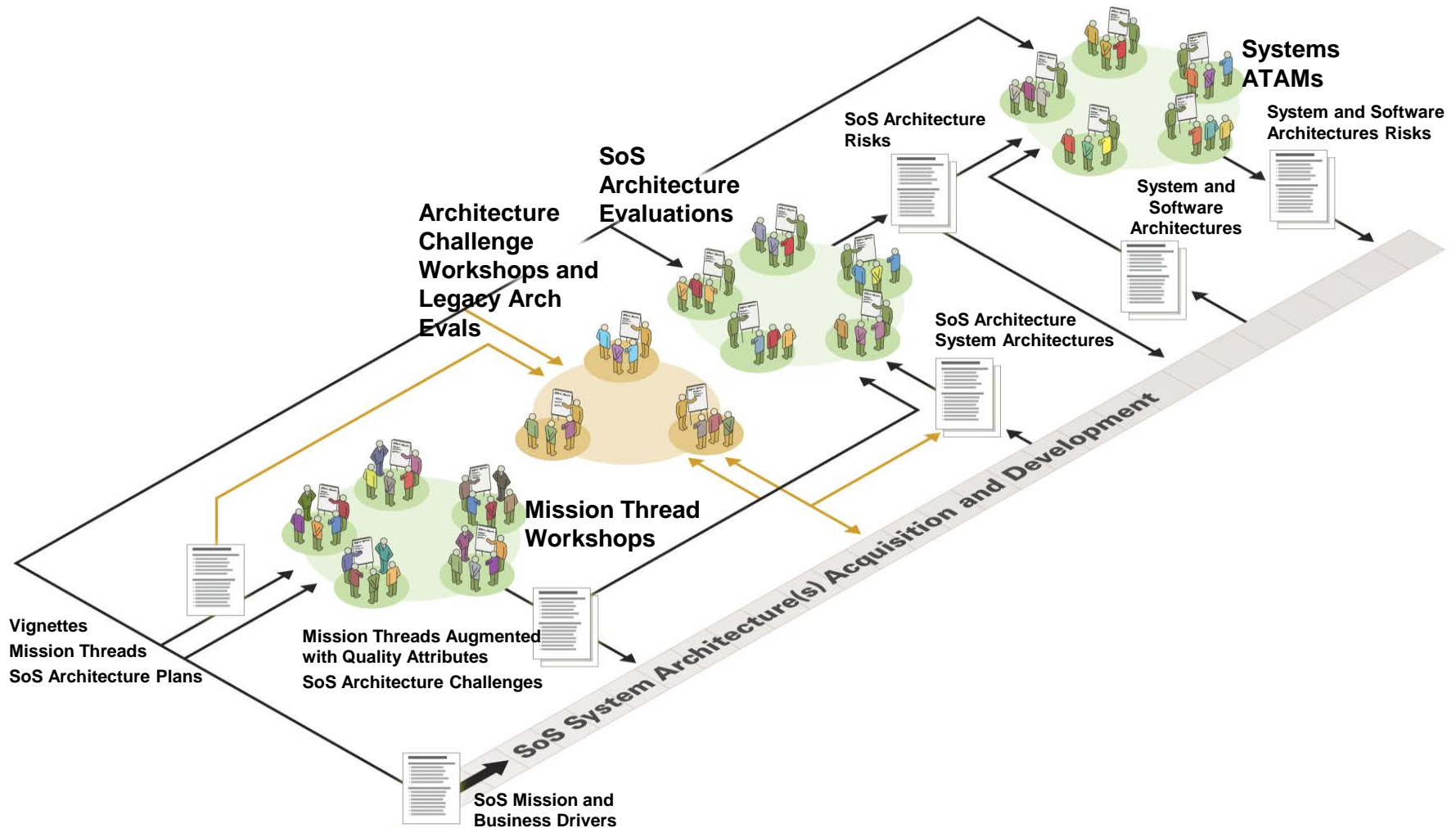
# Overview



# Overview



# Overview

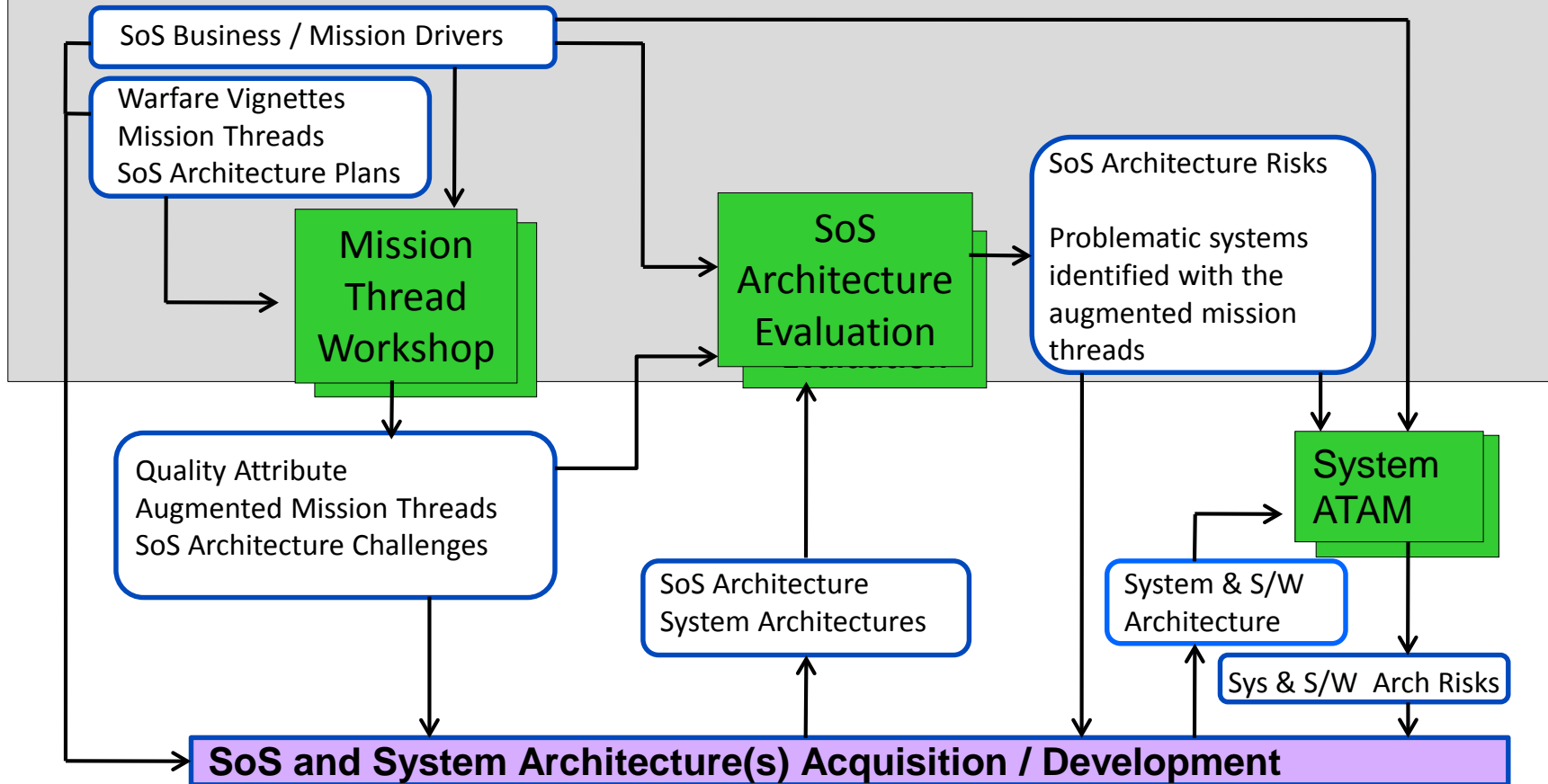


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# SoS Architecture Quality Attribute Specification and Evaluation Approach

- Early elicitation of quality attribute considerations
- Early identification and addressing of architecture challenges
- Early identification and mitigation of architectural risks



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